



⑫ **EUROPEAN PATENT SPECIFICATION**

④⑤ Date of publication of patent specification :
20.03.91 Bulletin 91/12

⑤① Int. Cl.⁵: **E02D 29/02, E04B 2/54**

②① Application number: **88302800.3**

②② Date of filing: **29.03.88**

⑤④ **Stackable grid material.**

③⑩ Priority: **30.03.87 US 32278**

④③ Date of publication of application :
05.10.88 Bulletin 88/40

④⑤ Publication of the grant of the patent :
20.03.91 Bulletin 91/12

⑧④ Designated Contracting States :
AT BE CH DE ES FR GB GR IT LI LU NL SE

⑤⑥ References cited :
GB-A- 1 058 611
GB-A- 2 078 833
PATENT ABSTRACTS OF JAPAN, vol. 10, no.
267 (M-516)[2323], 11th September 1986; &
JP-A-61 92 218 (AASUNIKUSU K.K.) 10-05-1986

⑦③ Proprietor: **REYNOLDS CONSUMER**
PRODUCTS, INC.
670 North Perkins Street
Appleton Wisconsin 54913 (US)

⑦② Inventor: **Bach, Gary**
1409 North Graceiand Avenue
Appleton, Wisconsin (US)
Inventor: **Kettner, Timothy**
Route 3, 128 Highview Drive
Appleton, Wisconsin 54915 (US)

⑦④ Representative: **Alexander, Thomas Bruce et**
al
Boult, Wade & Tennant 27 Furnival Street
London EC4A 1PQ (GB)

EP 0 285 378 B1

Note: Within nine months from the publication of the mention of the grant of the European patent, any person may give notice to the European Patent Office of opposition to the European patent granted. Notice of opposition shall be filed in a written reasoned statement. It shall not be deemed to have been filed until the opposition fee has been paid (Art. 99(1) European patent convention).

Description

The present invention relates to a grid structure which can be stacked up and filled with soil to create free standing walls and similar structures.

A grid structure comprising a repeating pattern of cells which are open at the top and bottom and used for soil confinement to provide a road base made from soils (sand, rounded rock, poorly graded aggregate, concrete, and the like) has been known and used for some time. A prime example is "Geoweb" (Trade Mark) plastic grid soil confinement system sold by Presto Products, Incorporated, P.O. Box 2399, Appleton, Wisconsin 54913 and disclosed in a booklet entitled "Geoweb Grid Confinement System" available from Presto Products, Incorporated. "Geoweb" grid cells are made from plastic strips which are joined on their faces in a side by side relationship at alternating spacings so that when the strips are stretched out in a direction perpendicular to the faces of the strips, the resulting grid section is honeycomb-like in appearance, with sinusoidal or undulant shaped cells.

Voluminous reports have praised the ability of "Geoweb" grid cell material to support roadways. "Geoweb" grid cells have also been used in applications where one grid layer is stacked on another, such as a stepped back design for hill slope retention. Even free standing walls have been built with "Geoweb" grid cells. However, because the cells are open at the top and bottom, there is a tendency for fill material to leak out of the cells if the cell below is not properly positioned. Also, the exposed soil in a cell not adequately covered is subject to being blown away by the wind.

In an effort to overcome these problems, free standing structures have been built with alternating layers of grid confinement cells and sheet material, such as water permeable fabric. While this approach has helped to cover the exposed open tops and bottoms of the cells, it has not been completely successful, and, more importantly, requires the additional use of the separate sheet material.

The present invention is characterised in that the cell walls of the grid structure have regions of differing height such that at least a part of the top edge of the cell wall on the perimeter of a lower layer of a grid structure overlaps at least a part of the bottom edge of the cell wall of the perimeter of an upper layer of a grid structure on top of the lower layer when the internal cell walls of the upper layer rest on top of the internal cell walls of the lower layer.

The grid structure can be used in repeated layers without the need for intermediate sheet material, and significantly reduces exposure to or leakage from material in the perimeter cells. The grid structure makes it simple to build a wall or other free standing structure without exposed tops and bottoms of cells on the perimeter faces of the structure.

In the accompanying drawings :

Figure 1 is a perspective view depicting the construction of a wall using grid structures ;

Figure 2 is an enlarged perspective view of a corner portion of a grid structure like the structures used in the wall shown in Figure 1 before it is filled with soil ;

Figure 3 is a plan view of one of the inside strips of the grid structure used on upper layers of the wall of Figure 1 ;

Figure 4 is a plan view of one of the outside strips of the grid structure used on upper layers of the wall of Figure 1 ;

Figure 5 is a plan view of one of the inside strips of the grid structure used on the lowermost layer of the wall of Figure 1 ;

Figure 6 is a plan view of one of the outside strips of the grid structure used on the lowermost layer of the wall of Figure 1 ;

Figure 7 is a side elevational view taken along line 7-7 of Figure 1 ;

Figure 8 is a sectional view (excluding the soil) taken along line 8-8 of Figure 1 ; and

Figure 9 is a sectional view taken along line 9-9 of Figure 7.

Figure 1 depicts a wall being constructed with stackable soil confinement grid structures 10. The grid structure 10 is comprised of a plurality of strips of plastic 20 which are bonded together, one strip to the next, at alternating and equally spaced bonding areas.

In Figure 2, each layer of grid structure 10 is made of an even number of uniformly thick plastic strips 20 in side by side relationship, bonded by ultrasonic welding. The regions of differing height of the inside strips 22 differ in their pattern from the outside strips 24, as more fully described hereafter. The bonding between strips may best be described by thinking of the strips as being paired, starting with an outside strip 24 paired to an outermost inside strip 22, a pair of the next two inside strips 22, and so on. Each such pair is bonded at a bonding area constituting an end weld 32 adjacent to the end 34 of each strip 20. A short tail 36 between the end 34 of the strip 20 and the end weld 32 is provided to stabilize segments of the strip 20 adjacent to the outside weld 32. Each pair of strips is welded together at additional bonding areas 14, creating equal length strip segments between the end welds 32.

In addition to these welds, one strip 20 from each adjacent pair of strips is also welded together at positions intermediate each of the welds in the pairs of strips, referred to hereafter as non-pair bonding areas 16. As a result, when the plurality of strips 20 are stretched in a direction perpendicular to the faces of the strips, the plastic strips bend in a sinusoidal manner and form a grid of cells 40 in a repeating cell pattern.

Each cell 40 has a cell wall made from one strip 20 and a cell wall made from a different strip 20.

In this configuration, the end section of each strip 20 forms one wall of a cell on the perimeter of the grid structure 10. In addition, there are outside strips 24 which form cell walls all lying on the perimeter of the grid structure. When several layers of grid structures 10 are stacked on top of one another, it is the open tops and bottoms of these perimeter cells which are exposed if each cell above and below is not directly aligned.

The lowermost or base grid structure 12 of a stack is designed to rest on a flat surface (Figure 1). Since it has no grid structure layer 10 below it with which it needs to align, the bottom edge of each strip 20 in the base structure layer 12 is uniformly even. However, in many instances a grid structure layer 10 would be suitable as the bottom layer of a stack. The base structure layer 12 has inside strips 26 and outside strips 28 which differ from each other just as the inside strips 22 and outside strips 24 of the layer 10 differ from each other. Figures 3 to 6 respectively are plan views of the inside and outside strips 22, 24, 26 and 28, showing the shapes of these strips.

The inside strip 22 (Figure 3) used for grid structure layers 10 has a central cut-out section 42 which is a predetermined distance below the upstanding edge section 44 adjacent to the ends 34 of the strip 22. The central section 42 extends just beyond the region of the outermost non-pair bonding area 16.

The bonding areas 14 are about 33 cm (13 inches) apart on each strip, as are the non-pair bonding areas 16. Since the non-pair bonding areas 16 are intermediate the bonding areas 14, each cell wall comprises a section of the plastic strip about 16.5 cm (6.5 inches) in length, between the alternating bonding areas 14 and non-pair bonding areas 16. The tail 36 is about 2.54 cm (1 inch) in length. The central section 42 begins about 14 cm (5.5 inches) from one end weld 32 of the strip 22 and runs to a point about 14 cm (5.5 inches) from the other end weld 32. Since the outermost non-pair bonding area 16 is about 16.5 cm (6.5 inches) from the end weld 32, this central section 42 extends about 2.54 cm (1 inch) past the outermost non-pair bonding area 16 on each half of the strip 22.

The bottom edge of each strip 22 also has inwardly cut-out or notched corner areas 48 at each end section adjacent to each end weld 32 (at each bottom corner). This results in a central section 46 descending below the level of the corner areas 48. The distance between the levels of section 46 and corner areas 48 is approximately equal to the predetermined distance between the height of the top central section 42 and upstanding section 44. This predetermined distance is about 1.3 cm (0.5 inch). The length of the notch in the corner areas 48 is about 6.4 cm (2.5 inches), which is slightly longer than the tail 36, extending about 3.8 cm (1.5 inches) outside of

the end weld 32.

As seen in Figure 4, the outside strip 24 has a uniformly even straight top edge with no cut-outs but includes notches or cut-outs in its bottom corner areas 48 which are identical to the notches in the corner areas 48 of the inside strip 22. As shown in Figures 5 and 6, strips 26 and 28 are respectively identical to strips 22 and 24 except that (as mentioned previously) the bottom edges of strips 26 and 28 are uniformly even and straight with no cut-outs over the length of each strip.

After being welded together, the plastic strips 20 tend to retain a recti-linear shape. This allows the grid structure 10 to be easily shipped, stored and handled until it is used to make a wall or other structure.

A method of constructing walls (as shown in Figure 1) is to anchor guiding posts 18 into the ground at the corner positions where the wall is to be built. The base layer grid structure 12 is next stretched out and the corner cells are slid down over the posts 18. Soil (such as sand or any other readily accessible and suitable fill material) is next filled into the cells 40 of the base layer grid structure 12 and compacted (if desired). A grid structure layer 10 is then stretched out and slid down over the posts 18.

In this position, and as shown in Figures 7 and 8, the notches 48 in the bottom of this second layer 10 and the cut outs 42 in the top of the base layer 12 cooperate so that in the central section of the grid structures, the cell walls of the top layer rest on the cell walls of the bottom layer. In these internal areas, alignment of the cells is not critical. On the perimeters of the grid structures, however, the downwardly extending central sections 46 of the strips 24 of the grid structure layer 10 contact the top edges of the outside strips 28 of the base layer 12 along its entire length, and the central sections 46 of the strips 22 will contact the upstanding edge sections 44 of the inside strips 26 for a distance of about 10.2 cm (4 inches). In order to get the second layer 10 to nest properly, the flexible plastic strips must be slightly deformed so that the interfering areas become overlapping areas, the portions of the cell wall on the base layer 12 being outside the portions from the second layer of the grid structure 10 (See Figure 9). Because of the notches 48 in the bottom edges, the perimeter corners of the perimeter cells cross over the upstanding sections 44 of the lower layer grid structure. After placement, the second layer 10 is then filled with soil, and the process is repeated, stacking as many layers of the grid structure 10 as necessary to build the wall to the desired height.

Each plastic strip 20 is 20.3 cm (8 inches) wide. The grid structures may be manufactured to result in grids of any dimension, but are typically 91.4 to 244 cm (3 to 8 feet) wide and 2.44 to 6.1 m (8 to 20 feet) in length when stretched out for use. The preferred plastic is sheet extruded polyethylene, 1.27 mm (50

mil) thick. Carbon black may be included to help prevent ultraviolet degradation of the grid material exposed to sunlight. The bonding may be accomplished by a number of methods known in the art. A method of ultrasonic welding is accomplished using the process and apparatus disclosed in US-A-4,647,325. The bond is formed by groups of welding tips simultaneously contacting the strips 20, the weld thus substantially traversing the entire width of the strips 20.

The design provides two features which help to keep soil or other fill material in perimeter cells from escaping from stacked grid structures. First, the overlap on the cell walls on the perimeter of the grid structure is useful to align the cells during stacking. By nesting the walls of the top cells into the bottom cells, the perimeter cells are easily aligned and stay in alignment during the process of filling the cells with soil. Second, the overlap creates a barrier against soil particles leaking out between layers of aligned cell walls.

The grid structure can be used to form walls using locally available fill, such as soil, in a simple, quick and inexpensive fashion, but which have minimal loss of soil material from the perimeter cell walls. This is especially useful in situations where very dry, fine granular soil such as sand is used. It is conceivable to build "sand houses" in desert terrain, like the sod houses of early prairie pioneer days in the United States of America.

Of course it should be understood that a wide range of changes and modifications can be made to the construction described above. For example, if overlapping and alignment is needed on only one surface of a wall, no distinct outside strips 24 and 28 would be needed. Likewise, no special base layer 12 is needed if the surface on which the wall is built is soft enough so that downwardly extending bottom edge sections 46 of the strips 22 and 24 would sink into the soft surface. Further, instead of having cut-out central sections 42 on top of the strips 20 and downwardly extending central sections 46 on the bottom, the two could be reversed. If the central section of strips 22 extended above the end sections, then the outside strips 24 and 28 would not need a cut-out or notch in their bottom corners, but would need a notch in the bottom edge at each bonding area.

Claims

1. A grid structure (10, 12) comprising a repeating pattern of cells (40) which are open at the top and bottom ; characterised in that

the cell walls (20) of the grid structure have regions of differing height (42, 44, 46, 48) such that at least a part of the top edge of the cell wall (28) on the perimeter of a lower layer of a grid structure (12) overlaps at least a part of the bottom edge (46) of the cell wall (24) on the perimeter of an upper layer of a grid

structure (10) on top of the lower layer when the internal cell walls (22) of the upper layer (10) rest on top of the internal cell walls (26) of the lower layer (12).

2. A grid structure as claimed in Claim 1, wherein the overlap comprises side by side cell walls, the cell wall perimeter of the lower grid fitting on the outside of the cell wall perimeter of the upper grid.

3. A grid structure as claimed in Claim 1 or 2, wherein the cell walls comprise long strips (22) of flexible material bonded together, one strip to the next, at alternating and equally spaced bonding areas (14).

4. A grid structure as claimed in Claim 3, wherein the strips are plastic and the bonding areas comprise ultrasonic welds substantially traversing the width of the strip.

5. A grid structure as claimed in any preceding Claim, wherein the cell walls (22) on the perimeter of the top of the grid structure have upstanding sections (44), and the bottom of the grid structure has cut-outs at the perimeter corners (48) of perimeter cells which cross over the upstanding sections (44) of a lower layer of grid material.

6. A grid structure as claimed in Claim 1 and comprising :

an even number of uniformly-wide, plastic strips (20) in side by side relationship comprising a plurality of inside strips (22) and two outside strips (24) flanking the sides of the two outermost inside strips ;

the strips being ultrasonically welded together at positions along the strips such that each pair of adjacent strips is welded together at end welds (32) adjacent to the ends (34) of the strips, leaving a short tail (36) between the end of the strip and each end weld (32), and also being welded at bonding areas (14) between the end welds (32) to create equal length segments between all welds; and one strip from each of two adjacent pairs of strips also being welded together at non-pair bonding areas (16) intermediate each of the welds at the bonding areas (14) ;

the top edge of each inside strip (22) having a cut-out central section (42) of a predetermined distance below the height of the upstanding edge (44) of the strip adjacent to the end weld (32) ; the top edge of each outside strip (24) being of uniform height ; and

the bottom edge of each strip having inwardly cut-out areas (48) adjacent to the end welds (32), the bottom edge cut-outs being of a depth approximately equal to the said predetermined distance.

7. A grid structure as claimed in Claim 6, wherein the length of the bottom edge cut-out (48) is longer than the length of the tail (36), and the central cut-out section (42) of the top edge extends beyond the outermost non-pair bonding area (16).

8. A grid structure as claimed in Claim 6 or 7, wherein the strips comprise polyethylene.

9. A grid structure as claimed in Claim 6, 7 or 8, wherein the strips are about 1.27 mm (50 mil) in thickness.

10. A grid structure as claimed in Claim 6, 7, 8 or 9, wherein the predetermined distance is about 1.27 cm (0.5 inch).

11. A grid structure as claimed in Claims 6, 7, 8, 9, 10, wherein the strips are about 20.3 cm (8 inches) thick and the equal length segments between welds each measure about 33 cm (13 inches).

12. A grid structure as claimed in any one of Claims 6 to 13, wherein the bottom cut-outs (48) extend about 3.8 cm (1.5 inches) inside of the end welds (32), and the central cut-out section (42) extends about 2.54 cm (1 inch) beyond the end non-pair bonding area (16).

13. A grid structure as claimed in Claim 1 and comprising a plurality of plastic strips (22) bonded together on their faces in a side by side relationship at bonding areas (14, 16) which are staggered from strip to strip such that the plurality of strips may be stretched in a direction perpendicular to the face of the strips to form the cells (40), the strips forming the cell walls,

the strips comprising two outside strips (24) and one or more inside strips (22); and the inside strips (22) having at least one cut-out (42, 48) in the top and bottom edge.

14. A grid structure as claimed in Claim 13, wherein the outside strips (24) have edges such that the cell walls formed by the outside strips overlap at each cell wall formed by the outside strips.

15. A grid structure as claimed in Claim 13 or 14, wherein the inside strips (22) have a top edge with a cut-out central section (42) and a bottom edge with cut-out end sections (48).

16. A grid structure as claimed in Claim 13, 14 or 15, wherein

the outside strips (24) have an even top edge and a bottom edge with cut-out end sections (48).

17. A grid structure as claimed in Claims 13, 14, 15 or 16, wherein

each strip includes two tail sections (36) each of about 2.54 cm (1 inch) in length between an end weld (32) and the end of the strip;

the length of the section of plastic strip between bonding areas (14, 16) is approximately 16.5 cm (6.5 inches); and

the cut-out (42) on the top edges of the inside strips (22) begins at about 14 cm (5.5 inches) from each end weld (32) and the cut-outs (48) on the bottom edges of both the inside and outside strips (22, 24) extend about 3.8 cm (1.5 inches) past the end welds (32), resulting in the overlapping portions of the cell walls on a perimeter of the grid being approximately 10.2 cm (4 inches) in length.

18. A grid structure as claimed in any one of

Claims 13 to 17, wherein the strips (20) are approximately 20.3 cm (8 inches) in width and both cut-outs on the top and bottom edges are approximately 1.27 cm (0.5 inch) deep.

5 Ansprüche

1. Eine Gitterstruktur (10, 12), die ein sich wiederholendes Muster von Zellen (40) umfaßt, welche auf der Oberseite und der Podenseite offen sind; dadurch gekennzeichnet, daß die Zellenwände (20) der Gitterstruktur Bereiche von differierenden Höhen (42, 44, 46, 48) derart aufweisen, daß wenigstens ein Teil des oberen Randes der Zellenwand (28) am Außenumfang einer unteren Schicht einer Gitterstruktur (12) wenigstens einen Teil des Bodenrandes (46) der Zellenwand (24) am Außenumfang einer oberen, auf der Oberseite der unteren Schicht angeordneten Schicht einer Gitterstruktur (10) überlappt, wenn die inneren Zellenwände (22) der oberen Schicht (10) auf der Oberseite der inneren Zellenwände (26) von der unteren Schicht (12) aufsitzen.

2. Eine Gitterstruktur nach Anspruch 1, worin die Überlappung Seite an Seite angeordnete Zellenwände umfaßt, wobei der Zellenwandumfang von dem unteren Gitter an die Außenseite von dem Zellenwandumfang des oberen Gitters angepaßt ist.

3. Eine Gitterstruktur nach Anspruch 1 oder 2, worin die Zellenwände lange Streifen (22) aus flexiblem Material umfassen, die miteinander, ein Streifen an den nächsten, in abwechselnden und gleich beabstandeten Verbindungsbereichen (14) verbunden sind.

4. Eine Gitterstruktur nach Anspruch 3, worin die streifen aus Plastik bestehen und die Verbindungsbereiche Ultraschallschweißungen umfassen, welche sich im wesentlichen quer über die Breite des Streifens erstrecken.

5. Eine Gitterstruktur nach wenigstens einem der vorhergehenden Ansprüche, worin die Zellenwände (22) auf dem Außenumfang der Oberseite der Gitterstruktur nach oben vorstehende Sektionen (44) aufweisen, und der Boden der Gitterstruktur Ausschnitte an den Umfangsecken (48) von Umfangszellen aufweist, welche die nach oben vorstehenden Sektionen (44) einer unteren Schicht aus Gittermaterial kreuzen.

6. Eine Gitterstruktur nach Anspruch 1, die umfaßt:

eine gerade Anzahl von gleichmäßig breiten Plastikstreifen (20) in einer Seite-an-Seite-Anordnung, die eine Vielzahl von Innenstreifen (22) und zwei Außenstreifen (24), die die Seiten der zwei äußersten Innenstreifen flankieren, umfaßt;

wobei die Streifen durch Ultraschall an Positionen längs der Streifen derart zusammengeschweißt sind, daß jedes Paar von benachbarten Streifen an Endschweißungen (32), die an die

Ende (34) der Streifen an angrenzen, zusammen-
geschweißt ist, wobei ein kurzer Endabschnitt (36)
zwischen dem Ende des Streifens und der jeweili-
gen Endschweißung (32) ausgelassen ist, und
auch in Verbindungsbereichen (40) zwischen den
Endschweißungen (32) verschweißt sind, um
Segmente gleicher Länge zwischen allen
Schweißungen zu erzeugen, und wobei ein Strei-
fen aus jedem von zwei aneinandergrenzenden
Paaren von Streifen auch in nicht-paarigen Ver-
bindungsbereichen (16), die zwischen jeder der
Schweißungen bei den Verbindungsbereichen
(14) liegen, miteinander verschweißt sind ;
der obere Rand von jedem Innenstreifen (22) eine
ausgeschnittene zentrale Sektion (42) von einer
vorbestimmten Distanz unterhalb der Höhe des
nach oben stehenden Streifenrandes (44), der an
die Endschweißung (32) angrenzt aufweist ; der
obere Rand von jedem Außenstreifen (24) eine
gleichmäßige Höhe aufweist ; und
der Bodenrand von jedem Streifen nach innen
ausgeschnittene Bereiche (48) aufweist, die an
die Endschweißungen (32) angrenzen, wobei die
Bodenrandausschnitte eine Tiefe aufweisen, die
ungefähr gleich der vorbestimmten Distanz ist.

7. Eine Gitterstruktur nach Anspruch 6, worin die
Länge des Bodenrandausschnittes (48) länger als die
Länge des Endabschnitts (36) ist, und die zentrale
Ausschnittssection (42) des oberen Randes sich über
den äußersten nicht-paarigen Verbindungsbereich
(16) hinaus erstreckt.

8. Eine Gitterstruktur nach Anspruch 6 oder 7,
worin die Streifen Polyäthylen umfassen.

9. Eine Gitterstruktur nach Anspruch 6, 7 oder 8,
worin die Dicke der Streifen ungefähr 1,27 mm (50
mil) beträgt.

10. Eine Gitterstruktur nach Anspruch 6, 7, 8 oder
9, worin die vorbestimmte Distanz ungefähr 1,27 cm
(0,5 Inch) beträgt.

11. Eine Gitterstruktur nach den Ansprüchen 6, 7,
8, 9 oder 10, worin die Streifen ungefähr 20,3 cm (8
Inch) dick sind und die Segmente gleicher Länge zwi-
schen den Schweißungen jeweils etwa 33 cm (13
Inch) messen.

12. Eine Gitterstruktur nach wenigstens einem
der Ansprüche 6 bis 13, worin die Bodenausschnitte
(48) sich etwa 3,8 cm (1,5 Inch) nach innen von den
Endschweißungen (32) erstrecken, und die zentrale
Ausschnittssection (42) sich ungefähr 2,54 cm (1
Inch) über den nicht paarigen Endverbindungsbe-
reich (16) hinaus erstrecken.

13. Eine Gitterstruktur nach Anspruch 1, die eine
Vielzahl von Plastikstreifen (22) umfaßt, die an ihren
Seiten in einer Relation Seite an Seite in Verbin-
dungsbereichen (14, 16) miteinander verbunden sind,
wobei die Verbindungsbereiche von Streifen zu Strei-
fen derart versetzt sind, daß die Vielzahl von Streifen
in einer Richtung senkrecht zu den Seiten der Streifen

gestreckt werden kann, um die Zellen (40) zu bilden,
wobei die Streifen die Zellenwände bilden, und
wobei die Streifen zwei Außenstreifen (24) und
einen oder mehrere Innenstreifen (22) umfassen ;
und die Innenstreifen (22) wenigstens einen Aus-
schnitt (42, 48) in dem oberen und unteren Rand auf-
weisen.

14. Eine Gitterstruktur nach Anspruch 13, worin
die Außenstreifen (24) Ränder derart aufweisen, daß
die Zellenwände, die durch die Außenstreifen gebil-
det sind, an jeder Zellenwand, die durch die Außen-
streifen gebildet wird, überlappen.

15. Eine Gitterstruktur nach Anspruch 13 oder 14,
wobei die Innenstreifen (22) einen oberen Rand mit
einer ausgeschnittenen zentralen Sektion (42) und
einen unteren Rand mit einer ausgeschnittenen End-
sektion (48) aufweisen.

16. Eine Gitterstruktur nach Anspruch 13, 14 oder
15, worin die Außenstreifen (24) einen geraden obe-
ren Rand und einen Bodenrand mit ausgechnittenen
Endsektionen (48) aufweisen.

17. Eine Gitterstruktur nach Anspruch 13, 14, 15
oder 16, worin jeder Streifen zwei Endabschnittsek-
tionen (36) von jeweils etwa 2,54 cm (1 Inch) Länge
zwischen einer Endschweißung (32) und dem Ende
von dem Streifen aufweist ;

die Länge der Sektion des Plastikstreifens zwi-
schen Verbindungsbereichen (14, 16) ungefähr
16,5 cm (6,5 Inch) beträgt ; und

der Ausschnitt (42) auf den oberen Rändern der
Innenstreifen (22) bei etwa 14 cm (5,5 Inch) von
jeder Endschweißung (32) entfernt beginnt und
die Ausschnitte (48) auf den Bodenrändern
sowohl der Innen- als auch der Außenstreifen
(22, 24) sich etwa 3,8 cm (1,5 Inch) an den End-
schweißungen vorbei (32) erstrecken, was dazu
führt, daß die Überlappungsbereiche der Zell-
wände auf einem Umfangsrand des Gitters unge-
fähr 10,2 cm (4 Inch) in der Länge betragen.

18. Eine Gitterstruktur nach wenigstens einem
der Ansprüche 13 bis 17, worin die Breite der Streifen
(20) ungefähr 20,3 cm (8 Inch) beträgt und sowohl die
Ausschnitte auf den oberen und den unteren Rändern
ungefähr 1,27 cm (0,5 Inch) tief sind.

Revendications

1. Structure grillagée (10, 12) comprenant un
modèle répétitif de cellules (40) qui sont ouvertes aux
parties supérieure et inférieure, caractérisée en ce
que les parois cellulaires (20) de la structure grillagée
comportent des zones de hauteur différente (42, 44,
46, 48) de telle sorte qu'au moins une partie du bord
supérieur de la paroi cellulaire (28) sur le périmètre
d'une couche inférieure d'une structure grillagée (12)
recouvre au moins une partie du bord inférieur (46) de
la paroi cellulaire (24) sur le périmètre d'une couche

supérieure d'une structure grillagée (10) au-dessus de la couche inférieure lorsque les parois cellulaires intérieures (22) de la couche supérieure (10) sont disposées au-dessus des parois cellulaires intérieures (26) de la couche inférieure (12).

2. Structure grillagée suivant la revendication 1, caractérisée en ce que le recouvrement comprend côte à côte des parois cellulaires, le périmètre des parois cellulaires de la grille inférieure s'adaptant sur l'extérieur du périmètre des parois cellulaires de la grille supérieure.

3. Structure grillagée suivant l'une ou l'autre des revendications 1 et 2, caractérisée en ce que les parois cellulaires comprennent de longues bandes (22) de matière souple liées ensemble, d'une bande à la suivante, à l'endroit d'aires de liaison alternées et également espacées (14).

4. Structure grillagée suivant la revendication 3, caractérisée en ce que les bandes sont de matière plastique et les aires de liaison comprennent des soudures ultrasonores traversant pratiquement la largeur de la bande.

5. Structure grillagée suivant l'une quelconque des revendications précédentes, caractérisée en ce que les parois cellulaires (22) sur le périmètre de la partie supérieure de la structure grillagée comportent des sections droites (44) et la partie inférieure de la structure grillagée comporte des découpes aux coins périmétriques (48) de cellules périmétriques qui chevauchent les sections droites (44) d'une couche inférieure de matériau grillagé.

6. Structure grillagée suivant la revendication 1 et comprenant :

un nombre pair de bandes de matière plastique (20), de largeur uniforme disposées côte à côte comprenant une série de bandes intérieures (22) et deux bandes extérieures (24) encadrant les côtés des deux bandes intérieures les plus extérieures ;

les bandes étant soudées par ultrasons ensemble en des emplacements le long des bandes de telle sorte que chaque paire de bandes adjacentes soit soudée à l'endroit de soudures d'extrémité (32) adjacentes aux extrémités (34) des bandes, en laissant un bout (36) entre l'extrémité de la bande et chaque soudure d'extrémité (32), et soit également soudée à l'endroit d'aires de liaison (14) entre les soudures d'extrémité (32) pour créer des segments de longueur égale entre toutes les soudures, une bande de chaque paire de deux paires adjacentes de bandes étant également soudée à l'emplacement d'aires de liaison non appariées (16) intermédiaires à chacune des soudures aux aires de liaison (14) ;

le bord supérieur de chaque bande intérieure (22) comportant une section centrale découpée (42) d'une distance prédéterminée en dessous de la hauteur du bord droit (44) de la bande adjacente

à la soudure d'extrémité (32) ;

le bord supérieur de chaque bande extérieure (24) étant de hauteur uniforme ; et

le bord inférieur de chaque bande comportant des aires découpées vers l'intérieur (48) adjacentes aux soudures d'extrémité (32), les découpes du bord inférieur étant d'une profondeur approximativement égale à la distance prédéterminée précitée.

7. Structure grillagée suivant la revendication 6, caractérisée en ce que la longueur de la découpe de bord inférieur (48) est plus longue que la longueur du bout (36) et la section découpée centrale (42) du bord supérieur s'étend au-delà de l'aire de liaison non appariée (16) la plus extérieure.

8. Structure grillagée suivant l'une ou l'autre des revendications 6 et 7, caractérisée en ce que les bandes comprennent du polyéthylène.

9. Structure grillagée suivant l'une quelconque des revendications 6, 7 et 8, caractérisée en ce que les bandes ont une épaisseur d'environ 1,27 cm (50 millièmes de pouce).

10. Structure grillagée suivant l'une quelconque des revendications 6, 7, 8 et 9, caractérisée en ce que la distance prédéterminée est d'environ 1,27 cm (0,5 pouce).

11. Structure grillagée suivant l'une quelconque des revendications 6, 7, 8, 9 et 10, caractérisée en ce que les bandes ont environ 20,3 cm (8 pouces) d'épaisseur et les segments de longueur égale entre les soudures mesurent chacun environ 33 cm (13 pouces).

12. Structure grillagée suivant l'une quelconque des revendications 6 à 13, caractérisée en ce que les découpes inférieures (48) s'étendent sur environ 3,8 cm (1,5 pouce) à l'intérieur des soudures d'extrémité (32) et la section découpée centrale (42) s'étend sur environ 2,54 cm (1 pouce) au-delà de l'aire de liaison non appariée (16) d'extrémité.

13. Structure grillagée suivant la revendication 1, et comprenant une série de bandes de matière plastique (22) liées ensemble à leurs faces côte à côte à l'endroit d'aires de liaison (14, 16), qui sont décalées d'une bande à l'autre de telle sorte que la série de bandes puisse être étirée dans une direction perpendiculaire à la face des bandes pour former les cellules (40), les bandes formant les parois cellulaires,

les bandes comprenant deux bandes extérieures (24) et une ou plusieurs bandes intérieures (22) ; et

les bandes intérieures (22) comportant au moins une découpe (42, 48) aux bords supérieur et inférieur.

14. Structure grillagée suivant la revendication 13, caractérisée en ce que les bandes extérieures (24) ont des bords agencés de telle sorte que les parois cellulaires formées par les bandes extérieures font office de recouvrement à chaque paroi cellulaire

formée par les bandes extérieures.

15. Structure grillagée suivant l'une ou l'autre des revendications 13 et 14, caractérisée en ce que les bandes intérieures (22) ont un bord supérieur avec une section centrale découpée (42) et un bord inférieur avec des sections d'extrémité découpées (48). 5

16. Structure grillagée suivant l'une quelconque des revendications 13, 14 et 15, caractérisée en ce que les bandes extérieures (24) ont un bord supérieur plat et un bord inférieur avec des sections d'extrémité découpées (48). 10

17. Structure grillagée suivant l'une quelconque des revendications 13, 14, 15 et 16, caractérisée en ce que :

chaque bande comprend deux sections de bout (36), chacune d'environ 2,54 cm (1 pouce) de longueur, entre une soudure d'extrémité (32) et l'extrémité de la bande ; 15

la longueur de la section de bande de matière plastique entre des aires de liaison (14, 16) est d'approximativement 16,5 cm (6,5 pouce) ; et 20

la découpe (42) sur les bords supérieurs des bandes intérieures (22) commence à environ 14 cm (5,5 pouces) de chaque soudure d'extrémité (32) et les découpes (48) sur les bords inférieurs des bandes à la fois intérieures et extérieures (22, 24) s'étendent sur environ 3,8 cm (1,5 pouce) au-delà 25

des soudures d'extrémité (32), les parties de recouvrement des parois cellulaires sur un périmètre de la grille ayant ainsi approximativement 10,2 cm (4 pouces) de longueur. 30

18. Structure grillagée suivant l'une quelconque des revendications 13 à 17, caractérisée en ce que les bandes (20) ont approximativement 20,3 cm (8 pouces) de largeur et les découpes aux bords supérieur et inférieur ont chacune une profondeur d'approximativement 1,27 cm (0,5 pouce). 35

40

45

50

55

FIG. 1

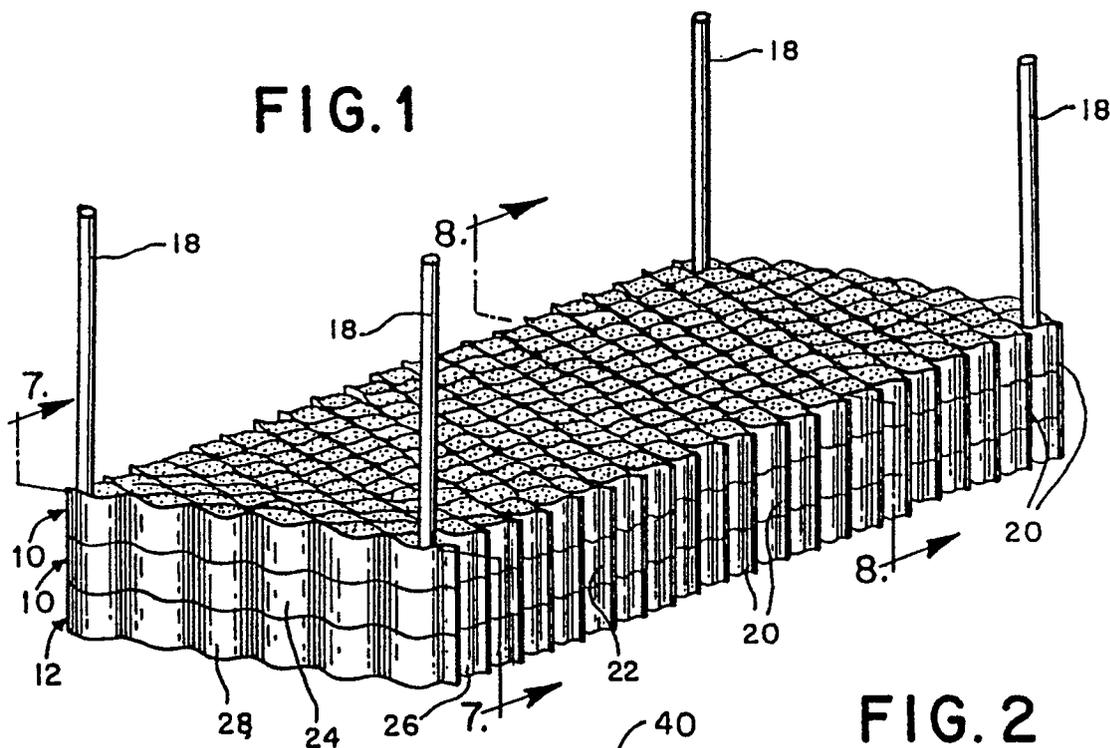


FIG. 2

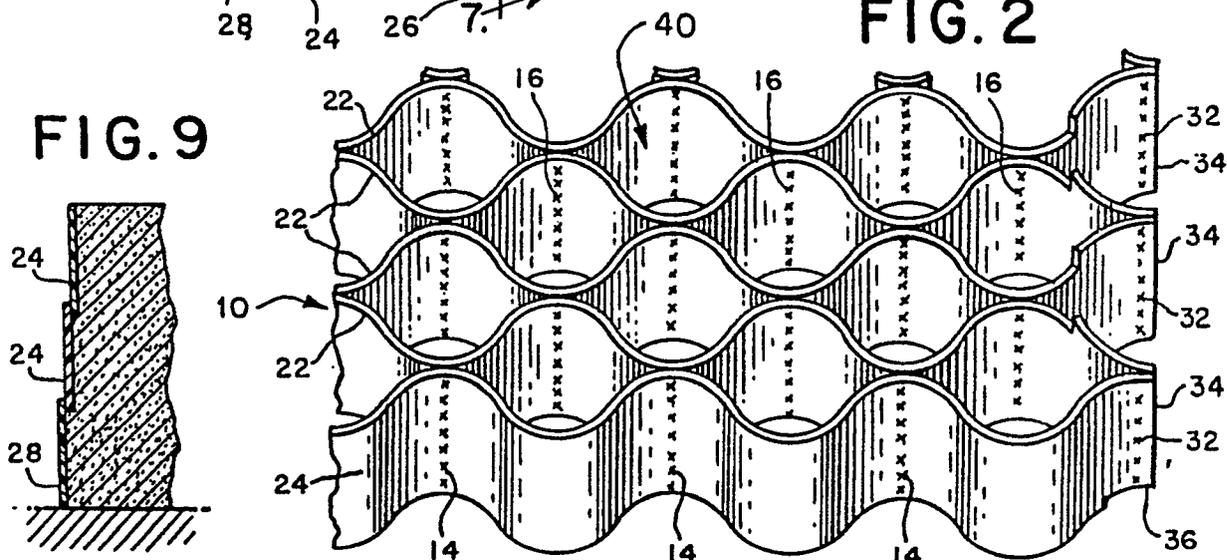


FIG. 9

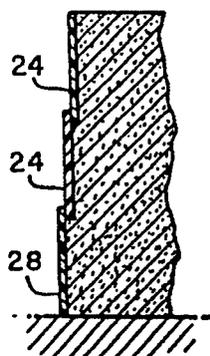


FIG. 3

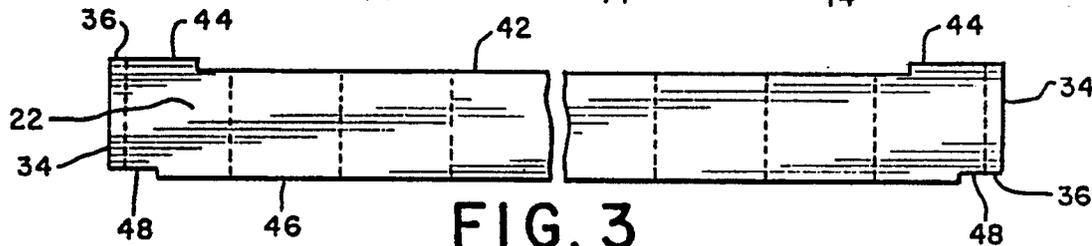


FIG. 4

